# Preservice Teachers' Video-Based Reflection Supported by the Teacher Dashboard: An Epistemic Network Analysis

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**Abstract:** To evaluate how video-based reflection supported by teacher dashboard influence teachers' abilities to reflect, 48 pre-service teachers from the same university in Eastern China were recruited to participating the comparative quasi-experiment to view the same classrooms video and make some discussion how to make the instructional design better in QQ. Twenty-four pre-service teachers were assigned in group in the experimental condition adopting video-based reflection with the teacher dashboard. Twenty-four pre-service teachers were the control condition adopting video-based reflection only. After analyze the teachers' collaborative discourse in conjunction with descriptive analysis alongside ENA, the results showed that video-based reflection supported by the teacher dashboard can improve the quality of reflection discussion and engage in deep and critical reflection to generate reason-based decisions with more teaching improvement.

**Keywords:** Video-based reflection, Teacher dashboard, Teacher collaborative discourse, Epistemic network analysis

## 1. Introduction

In teacher education, teachers' reflection is considered as an effective method of teacher learning. Reflection is "deliberate thinking about action with a view to its improvement" (Hatton & Smith, 1995, p. 40). Through their critical reflections, teachers can examine their past experiences and current practice in order to gain insights into their future teaching and continuing professional development (KleinKnecht & Schneider, 2013). Since the 1960s, teacher video-based reflection has been concerned as an effective means to promote teachers' reflection in the field of teacher education (Harford, MacRuairc & McCartan, 2010; Kleinknecht & Schneider, 2013). Teacher video-based reflection refers to the method that teachers watch, analyze and discuss teaching videos, and promote teachers to deeply reflect on teaching practice, so as to improve their professional ability (Hamel & Viau-Guay, 2019). Although classroom videos play a positive role in promoting teachers' reflection, the challenge of overwhelming data inherent in classroom video would be not beneficial for pre-service reflection due to the long and excessive content of classroom videos (Chen, 2020).

To address the problem, the technological approach of the teacher dashboard which visualizing the analyzing information of teacher and student discourse in classroom video by the form of indicator and graph was an alternative solution to facilitate teacher's video-based reflection. Nevertheless, research exploring how the teacher dashboard influence teachers' reflection process remains scares. Consider a growing body of epistemic network analysis (ENA) has been conducted to understand teachers' reflective thinking (e.g., Shaffer & Ruis, 2017). Therefore, in this study we intend to explore the effectiveness of the teacher dashboard on teacher's video-based reflection by focusing on analyzing teachers' online collaborative discourse by ENA.

## 2. Experiment design

### *2.1 Participant and research context*

In order to evaluate the effectiveness of video-based reflection supported by the teacher dashboard, the quasi-experiment was conducted in a university in Eastern China. Twenty-four pre-service teachers form in eight groups to make video-based reflection with the teacher dashboard in the experimental condition (EC). Twenty-four preservice teachers form in eight groups to make video-based in the control condition (CC).

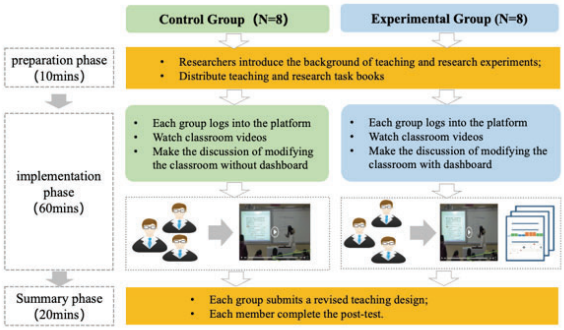


*Figure 1.* Research procedure

In this study, groups in the EC and CC were organized to completed the same video-based reflection task on different days but in the same computer laboratory using the same procedures. The research procedure was shown in figure 1.

### *2.2 Coding framework*

According to sociocultural theory, data from the group discourse recorded in QQ will act as a lens to investigate how pre-service teachers in groups engage into reflection (Wegerif et al., 2010). Therefore, in order to explore the different characteristics of preservice teachers' reflective talk in both conditions, we adopted a coding framework based on Mercer's (2000) original three types of talk, namely cumulative talk, disputational talk and exploratory talk. Each dimension contains some sub-dimension to describe the teacher's talk, which was shown in Table 1.

Table 1. *The coding framework*

| Type of talk | Category | Description |
|---|---|---|
| **Cumulative talk** | Information description (C.ID) | Teachers exchange and share information related to collaborative teaching and research tasks. |
| | Information inquiry (C.II) | Teachers ask questions about facts or task-related issues that do not involve reasoning. |
| | Suggestion (C.SU) | Teachers offer their own suggestions for completing the task, such as suggesting ways to complete the task efficiently. |
| | Coordination (C.CO) | Teachers monitors the progress of this collaborative task, including mobilizing teacher participation, planning the division of labor, etc. |
| **Disputational talk** | Common understand (D.CU) | Teachers simply echo each other's ideas. |
| | Evaluation without justification (D.EV) | Teacher expresses agreement or disagreement with other members' views or opinions without detailing the reasons. |
| | Objection (D.OB) | Teachers' rebuttals with simple evidence, but no suggestions for improvement. |
| **Exploratory talk** | Higher order question (E.HO) | Teachers ask questions to provoke others to think others' ideas, and the answers to these questions involve teachers' reasoning. |
| | Agreement with justification (E.AJ) | Teachers justify their ideas with reasons or provide additional arguments in response to others' follow-up questions. |
| | Disagreement with justification (E.DJ) | Teachers raise objections and give explanations. |
| | Alternative plan (E.AP) | The teacher's ideas for optimizing the original teaching involved, and the teacher's optimization of others' ideas. |

Table 2. *Example of encoded data*

| Teacher | Turn of talk | Code |
|---|---|---|
| 3 | First of all, 1. What are the teaching objectives of this lesson? | Cumulative talk-Information inquiry |
| 3 | You can also look at the materials in your hands first. | Cumulative talk-Suggestion |
| 3 | I think the teaching objectives of this lesson can be in three aspects. | Cumulative talk-Information description |
| 27 | I think the teaching objectives given in this lesson plan are the teaching objectives of this lesson. The teacher lists the knowledge skills with more obvious behavioral verbs such as say out, distinguish, name, and also the degree of performance, while these behaviors are observed. | Exploratory talk - Agreement with justification |
| 35 | The factual knowledge and procedural knowledge in the course knowledge have a large overlapping part, and I think it is enough to integrate them into one aspect. | Exploratory talk - Agreement with justification |

Messages sent within the QQ were segmented into turns before coding in Chinese. Acting as the unit of coding, a turn of talk can be coded in one category based on the above-mentioned three-part typology and descriptions of teachers' group talk in video-based reflection. The example was shown in Table 2.

A total of 1595 messages were collected for independent coding in this study, 740 messages from EC and 855 messages from CC. The coding was done by three coders. The coding consistency coefficient was 0.91 for coders 1 and 2, and 0.89 for coders 1 and 3. This proves that the coding results are reliable. For the coding results with different opinions, the coders negotiated and finally unified their opinions.

### *2.3 Data analysis*

We used a mixed methods approach to analysis (Creswell & Clark, 2017). First, we used a discourse analytic methodology to qualitatively code pre-service teacher' talk (Hardy et al., 2004). Then we applied ENA and statistical analysis to compare pre-service teacher' talk across treatments.

## 3. Result

### *3.1 The overall different of collaborative discourse in CC and EC*

The categories and frequency distribution of teachers' talk were shown in Table 3. As can be seen from Table 3, the proportions of codes related to cumulative talk are higher in CC (53.10%) than that in EC (36.22%). While, the proportions of codes related to exploratory talk are lower in CC (23.86%) than that in EC (40.00%). The proportions of codes related to disputational talk in CC and EC are similar, 23.04% and 23.78% respectively.

Table 3. *Coding frequency statistics table*

| Type of talk | Category | CC | EC |
|---|---|---|---|
| Cumulative talk | C.ID | 217 (25.38%) | 107 (14.46%) |
| | C.II | 102 (11.93%) | 40 (5.41%) |
| | C.SU | 51 (5.96%) | 57 (7.70%) |
| | C.CO | 84 (9.82%) | 64 (8.65%) |
| | | 454（53.10%） | 268（36.22%） |
| Disputational talk | D.CU | 119 (13.92%) | 119 (13.92%) |
| | D.EV | 102 (13.78%) | 102 (13.78%) |
| | D.OB | 70 (8.19%) | 70 (8.19%) |
| | | 197（23.04%） | 176（23.78%） |
| Exploratory talk | E.HO | 52 (7.03%) | 52 (7.03%) |
| | E.AJ | 8 (0.94%) | 8 (0.94%) |
| | E.DJ | 22 (2.97%) | 22 (2.97%) |
| | E.AP | 45 (5.26%) | 45 (5.26%) |
| | | 204（23.86%） | 296（40.00%） |

The chi-square tests we conducted to determine if these differences were statistically significant indicated that they were, in four cases, i.e.: all ($X^2$=58.037, p<0.001), cumulative talk ($X^2$=20.924, p<0.001), disputational talk ($X^2$=15.187, p<0.001), and exploratory talk($X^2$=68.009, p<0.001). It indicated that in the video-based reflection supported by the teacher dashboard, teachers' talk focus more on exploratory talk and less on cumulative talk.

### *3.2 The overall different ENA networks in CC and EC*

The epistemic networks of teachers in the EC and CC during the process of online discourse were shown in Figure 2.

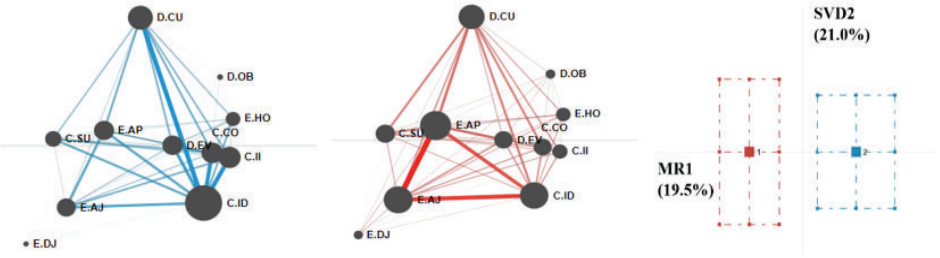


*Fig 2.* The Comparison of Epistemic Networks between the CC (left) and the EC (middle) and the network means of the two groups

The black dots in the ENA network shown in Figure 2 represent the positions of each code (e.g. Cumulative talk- information description, C.ID), and the connecting lines between the nodes represent the associations between the cognitive elements. The strength of the connections is reflected in the width of these lines. The thicker this line became and the higher the coefficient of connection between these two types of teacher talk. As shown in Figure 2, the mean of group teachers' reflective talk types in the CC was close to the right side of the X-axis, while the center of mass of the structure of group teachers' reflective talk types in the EC was close to the left side of the X-axis. The t-test showed that there was a significant difference between the group teachers' reflective talk types in the CC and EC on the X-axis (p=0.00<0.05). it means that there are significant different of cognitive network shown in the online discourse in both conditions.

Table 4. *Connection coefficients of the overall ENA networks in CC and EC*

| Connection coefficients | CC | EC |
|---|---|---|
| C. Coordination - C. Information description (C.CO-C.ID) | **0.26** | 0.12 |
| C. Information inquiry - C. Information description (C.II-C.ID) | **0.28** | 0.11 |
| D. Common understand - C. Information description (D.CU-C.ID) | **0.29** | 0.17 |
| E. Agreement and justification - C. Information description (E.AJ-C.ID) | 0.18 | **0.29** |
| E. Alternative plan - C. Information description (E.AP-C.ID) | 0.17 | **0.25** |
| E. Alternative plan - E. Agreement and justification (E.AP-E.AJ) | 0.17 | **0.36** |

As shown in Table 4, we found that the strength of the connections between "information description" and "common understand" (C.ID-D.CU, 0.29), between "information inquiry" and "information description" (C.II-C.ID, 0.28)," "information description" and "evaluation without argumentation" (C.ID-D.EV, 0.26)" are all stronger in the CC than in its EC. Conversely, the strength of the connections between "alternative plan" and "agreement and justification" (E.AP-E.AJ, 0.36), between "information description" and "agreement and justification" (C.ID-E.AJ, 0.29)," "alternative plan" and "information description" (E.AP-C.ID, 0.25)" are more stronger in the EC than in its CC. This indicates that with help of the video-based reflection with the teacher dashboard, group teachers have higher quality collaborative reflection discourse. During the group teachers' talk in the video-based reflection, teacher would like to description information about classroom video for common understanding, and ask questions about facts or task-related issues that do not involve reasoning. While in the video-based reflection with the teacher dashboard, teacher would like to description information about classroom video for optimizing others' ideas to form alternative plan, justify their ideas with

reasons or provide additional arguments in response to others' follow-up questions. Teacher will conduct higher level teaching reflection discussion, and generate teaching decisions with more teaching improvement.

## 4. Discussion and conclusion

The use of classroom videos to reflect on and analyze teaching practices is a valuable tool in teacher education (Sun & van Es, 2015). The results of this study build on this existing knowledge and show that video-based reflection with the teacher dashboard has positive effect on teachers' collaborative discourse, which can contribute to teachers' ability of reflection. Our findings from the pilot study provide important implications for designing systems and for future long-term research and practice aiming at improving the approach of video-based reflection on classroom video for teacher education and profession development supported by the teacher dashboard.

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